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(54) Title of the Invention: FINE PATTERN TRANSFER APPARATUS

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Specification

1. Title of the Invention:

FINE PATTERN TRANSFER APPARATUS

2. Scope of Patent Claims

(1) A fine pattern transfer apparatus that is an apparatus that transfers a fine pattern onto a sample using light or ultraviolet rays; characterized in that the path of the light between the final lens and the sample is filled with a liquid.
(2) A fine pattern transfer apparatus described in Claim 1; characterized in that it comprises an apparatus that fills the space between the lens and the sample with liquid at high speed or purges it at high speed.
(3) A fine pattern transfer apparatus described in Claim 1; characterized in that it is able to tightly seal a space that includes the path of the light using a bellows and an O ring.

3. Detailed Explanation of the Invention

(Purpose of the Invention)

(Industrial Field of Utilization)

This invention relates to a fine pattern transfer apparatus that forms a sub-micron pattern on a sample such as a wafer, etc.

(Prior Art)

Conventionally, there have been limits due to diffraction in cases where a fine pattern is transferred using light, so the current situation is such that contrivances such as making the aperture larger or using short wavelength light are being adopted, but they cannot be considered adequate.

(Problems to Be Solved by the Invention)

The present invention was made for such circumstances, and its purpose is to provide a fine pattern transfer apparatus that is able to reduce blurring of light due to diffraction.

(Configuration of the Invention)

(Means To Solve Problems)

Conventionally, the fact that high resolution is obtained by filling the space between the objective lens of a microscope and a sample with a liquid such as oil has been known. This principle is applied to steppers and aligners. What is a problem at this time is that, in contrast with microscopes, the sample is large, the visual field is also large

at approximately 10 mm square, and the distance between the sample and the lens is large, so there is a problem in terms of how to retain the liquid between the lens and the sample. In addition, in the case of a stepper, it is necessary to step-and-repeat samples, and countermeasures are necessary for this as well.

In the present invention, diffraction is made smaller using a liquid with a high refractive index, the space through which the light passes is tightly sealed using an O ring and a bellows to make filling with liquid possible, and the bellows is used to create room for the lens and the sample to move.

(Action)

In the present invention, if, for example, a liquid with the refractive index of 1.5 is used, the wavelength becomes 1/1.5, and diffraction becomes 1/1.5, so, for example, if an optical system that has a resolution of 0.5 μms is used, it is possible to increase the resolution to 0.33 μm.

(Embodiments)

The structure of a fine pattern transfer apparatus resulting from an embodiment of the present invention is shown in FIG. 1. A bellows 3 is attached to the outer part of the lens barrel 1 of the optical system, and the space through which the light passes is shielded from the outer part. A liquid with a high refractive index is filled into the inner part 11 of the bellows, and it is sealed with an O ring 4 so that there is no leakage to the outer part. The lens 2 is designed so that the refractive index of the space between it and a sample 6 matches that of the liquid. The sample is secured to a flat by means of a chuck plate 7, and the O ring is held down by a clamping jig 5. The sample can be moved in the x and y directions by means of a stage 8. When transfer is completed, a purge apparatus 10 operates to expel the liquid, and the wafer is replaced. Then, transfer is performed after a liquid supply apparatus 9 operates to cause filling with the liquid.

(Effects of the Invention)

Through the present invention, the following effects are exhibited.

(1) When the refractive index of the liquid is n, an n× resolving power is obtained.

(2) Since sealing with a bellows is performed, movement in the x and y directions is possible.

(3) Since there are apparatuses that purge and supply liquid at high speed, there is no drop in throughput.

4. (Brief Explanation of the Drawings)

FIG. 1 is a cross sectional drawing that shows the principal parts of an embodiment of a transfer apparatus resulting from the present invention.

1 optical lens barrel
2 final lens
3 bellows
4 O ring
5 O ring clamping jig
6 sample wafer
7 chuck plate
8 xy stage
9 liquid supply apparatus
10 liquid purge apparatus